Image-Reject Mixer
8 - 26 GHz

MAMX-011040-DIE
Rev. V2

Features

- Low Conversion Loss: 8 dB
- High Linearity: 17 dBm IIP3
- High Image Rejection: 22 dBc
- Wide IF Bandwidth: DC to 4 GHz
- High Isolation
- Die Size: 1.40 × 1.58 × 0.10 mm
- RoHS* Compliant

Applications

- Test & Measurement, Microwave Radio, and Radar

Description

MAMX-011040-DIE is an image-reject passive diode mixer MMIC. The mixer offers low conversion loss, high linearity, high image rejection and a wide IF bandwidth. The image-reject circuit configuration provides excellent port isolation while internal 50 Ω matching simplifies its application.

This mixer is well suited for applications such as test and measurement, microwave radio and radar.

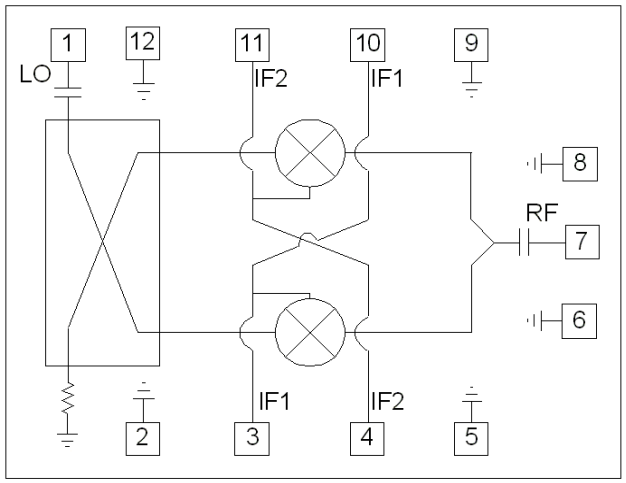
MAMX-011040-DIE is also available in a 4 mm QFN package. Refer to datasheet MAMX-011040.

Ordering Information

Part Number	Package
MAMX-011040-DIE	Vacuum Release Gel Pack[1]
MAMX-011040-SB2	Sample Board

1. Die quantity varies.

Functional Schematic



Bond-pad Configuration

Pin #	Function
1	LO
2, 5, 6, 8, 9, 12	Ground[2]
3	(IF1)[3]
4	(IF2)[3]
7	RF
10	(IF1)[3]
11	(IF2)[3]
13	Ground[4]

2. These pads are internally connected to ground, and they can be left unconnected.
3. Only one side IF1 and IF2 need to be connected, and leave the other side IF1 and IF2 unconnected.
4. The backside of the die must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications[5,6]: F_{IF} = 100 MHz, P_{LO} = +14 dBm, T_A = 25°C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
LO and RF Frequency	—	GHz	8	—	26
IF Frequency	—	GHz	0	—	4
LO Power	—	dBm	—	14	—
Conversion Loss	8 - 24 GHz 24 - 26 GHz	dB	—	8	9.5 11
Input P1dB	—	dBm	—	6	—
Input IP3	P_{RF} = -10 dBm/tone, Δf = 1 MHz	dBm	—	17	—
Input IP2 (Half IF)	P_{RF} = -10 dBm/tone, Δf = 1 MHz	dBm	—	40	—
LO-to-RF Isolation	—	dB	—	35	—
LO-to-IF Isolation	—	dB	—	35	—
RF-to-IF Isolation	—	dB	—	15	—
Image Rejection	8 - 26 GHz	dBc	17	22	—
Amplitude Imbalance	—	dBc	—	±2	—
Phase Imbalance	—	°	—	±10	—
RF Return Loss	RF = 18 GHz	dB	—	6	—
IF Return Loss	IF = 2 GHz	dB	—	12	—

5. All specifications refer to down-conversion operation, unless otherwise noted.
6. Characterization measurements were taken using RF probes, with I/O port configuration shown in Assembly Guideline Diagram on page 8.

Absolute Maximum Ratings[7,8]

Parameter	Absolute Maximum
LO Power	23 dBm
RF or IF Power	20 dBm
Junction Temperature[9]	+150°C
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C

7. Exceeding any one or combination of these limits may cause permanent damage to this device.
8. MACOM does not recommend sustained operation near these survivability limits.
9. Operating at nominal conditions with $T_J \leq +150°C$ will ensure MTTF > 1 x 10^6 hours.

Handling Procedures

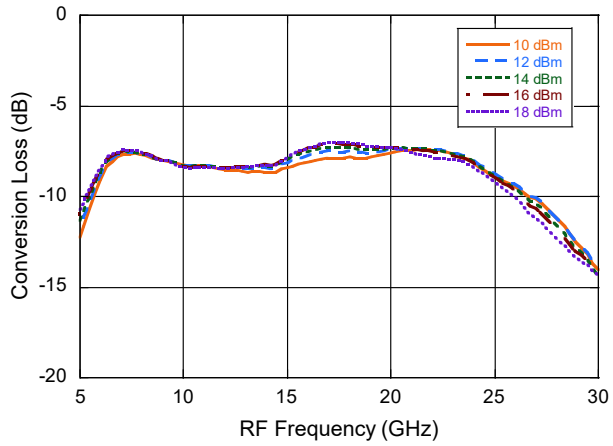
Please observe the following precautions to avoid damage:

Static Sensitivity

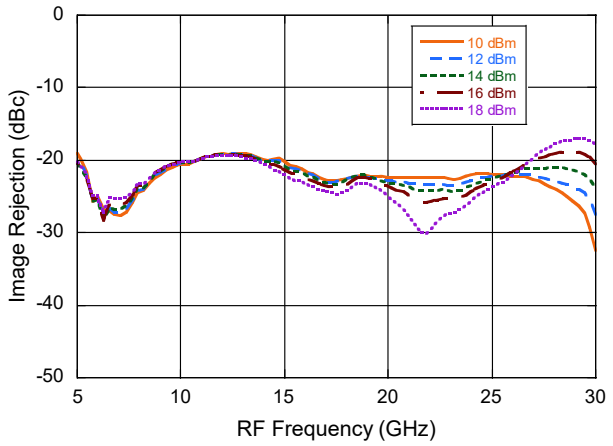
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1A devices.

Typical Performance Curves: 90° Hybrid @ 100 MHz IF

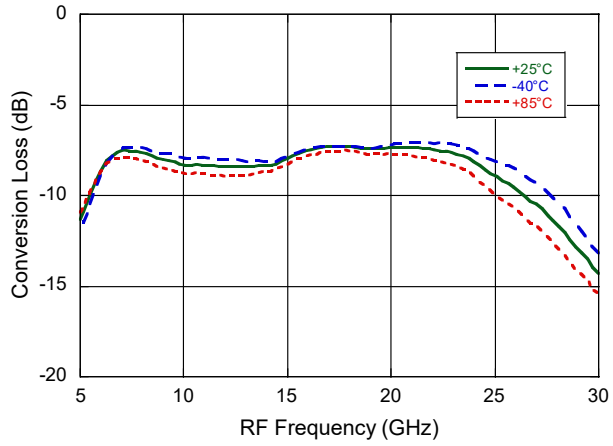
Down Conversion Gain (Upper Side Band) over LO Drive



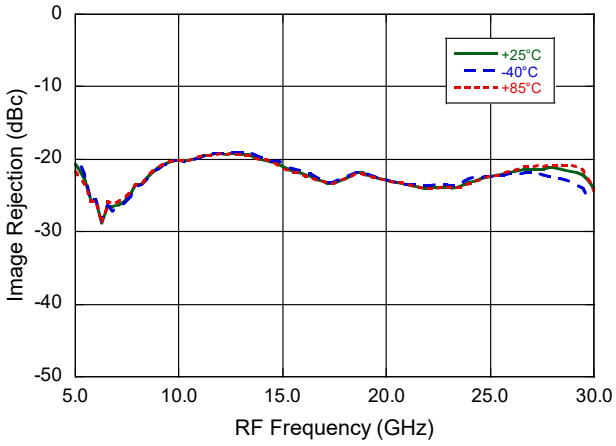
Down Conversion Image Rejection (Upper Side Band) over LO Drive



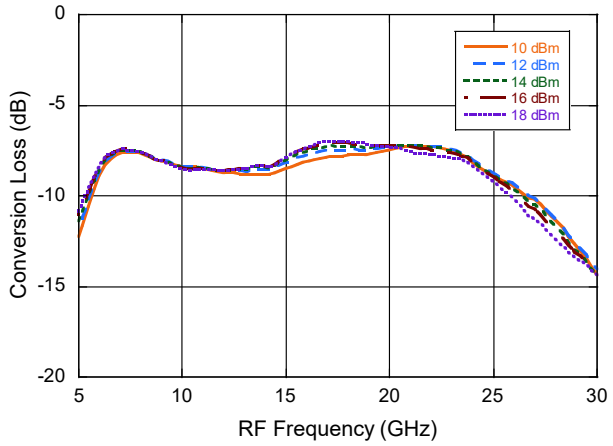
Down Conversion Gain (Upper Side Band) over Temperature



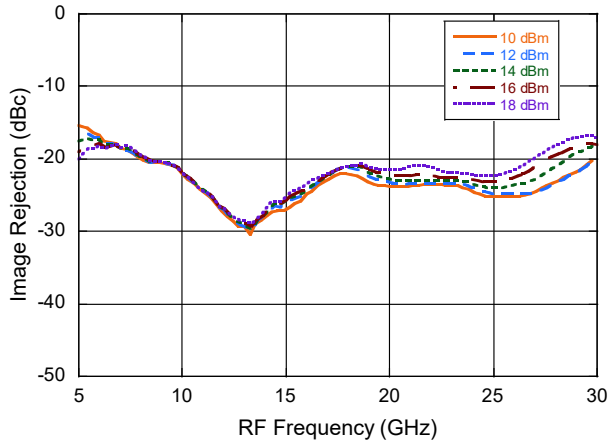
Down Conversion Image Rejection (Upper Side Band) over Temperature



Down Conversion Gain (Lower Side Band) over LO Drive

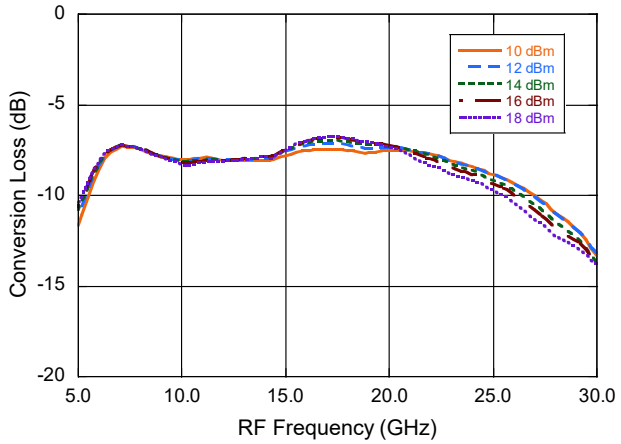


Down Conversion Image Rejection (Lower Side Band) over LO Drive

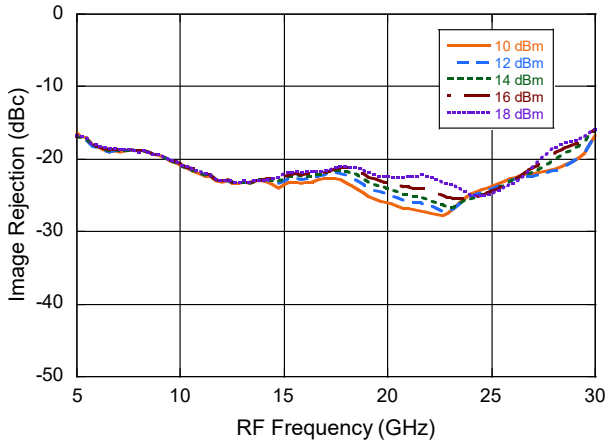


Typical Performance Curves: 90° Hybrid @ 100 MHz IF

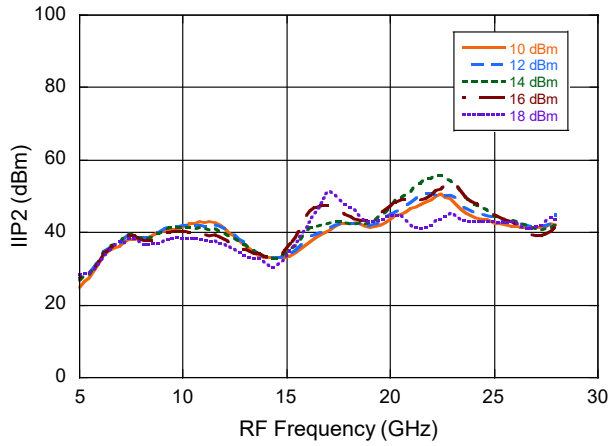
Up Conversion Gain (USB) over LO Drive



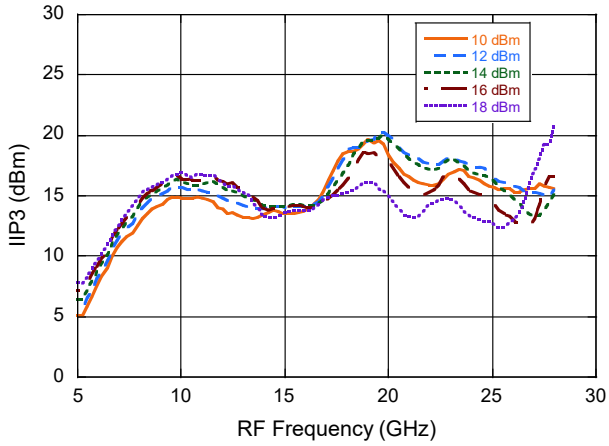
Up Conversion SSB (USB) over LO Drive



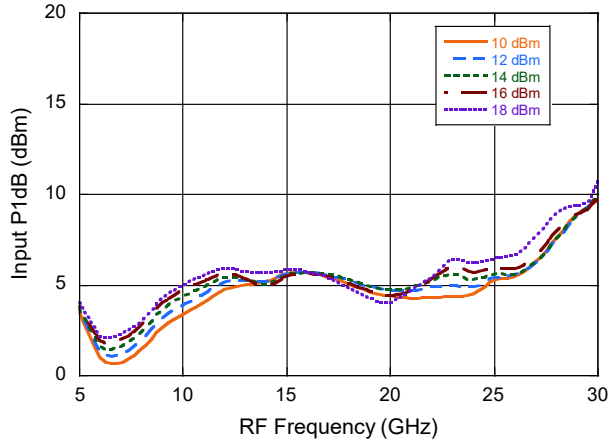
Down Conversion IIP2 (USB) over LO Drive



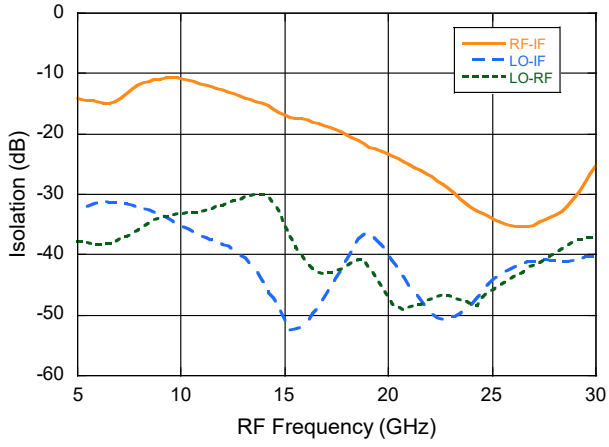
Down Conversion IIP3 (USB) over LO Drive



Down Conversion P1dB (USB) Over LO Drive

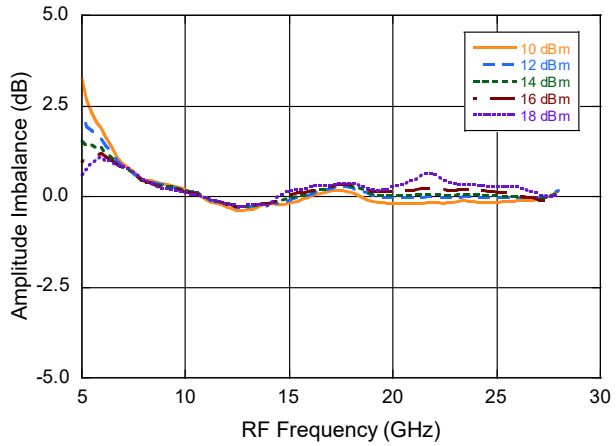


Down Conversion Isolation

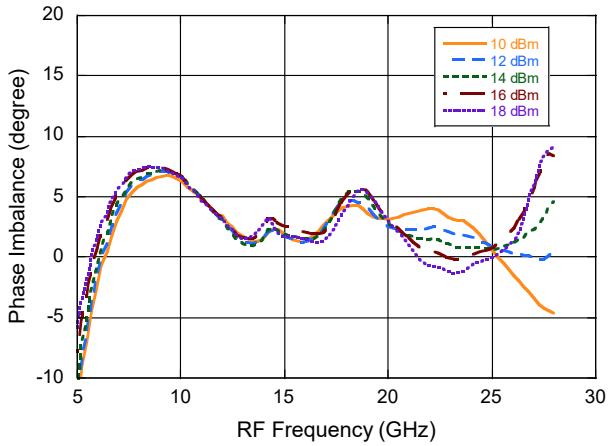


Typical Performance Curves:

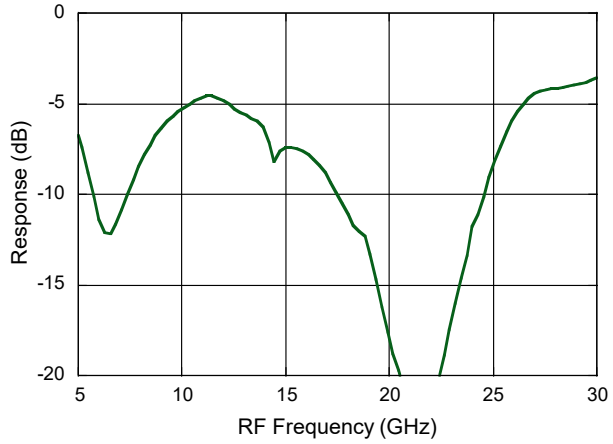
Amplitude Imbalance



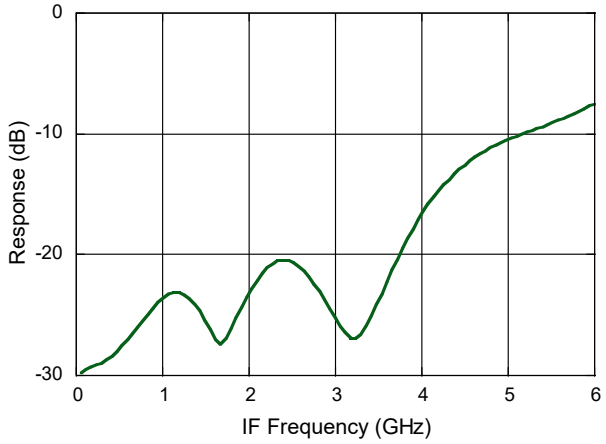
Phase Imbalance



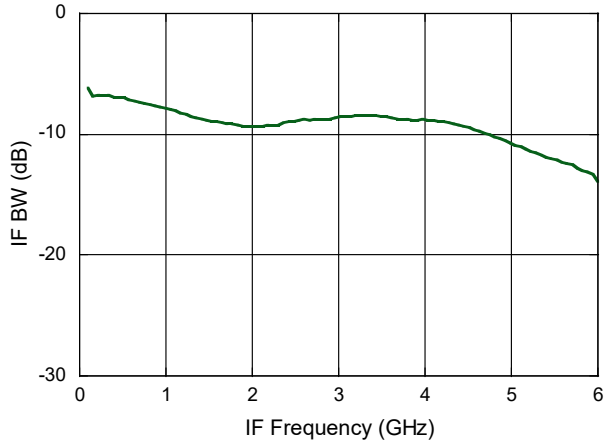
RF Return Loss



IF Return Loss



IF Bandwidth



MxN Spurious Rejection @ IF Port

RF = 15.9 GHz @ -10 dBm
LO = 16 GHz @ +14 dBm
All values in dBc below, the IF output power level

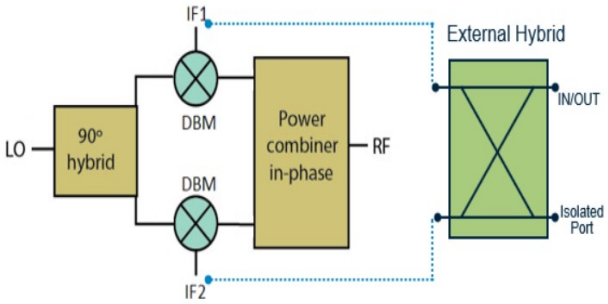
	NxLO				
MxRF	**0**	**1**	**2**	**3**	**4**
0	X	6	10	11	X
1	19	0	48	39	58
2	76	92	51	63	63
3	72	80	87	56	90
4	X	X	X	102	81

LO Harmonics

LO = +14 dBm
All values in dBc below,
input LO level measured at RF

n LO spur at RF port				
LO GHz	**1**	**2**	**3**	**4**
6	51	50	62	52
8	37	46	53	50
10	36	50	60	45
12	36	53	65	42
14	30	47	44	N/A
16	47	57	41	N/A
18	47	56	N/A	N/A
20	48	49	N/A	N/A
22	45	50	N/A	N/A
24	48	42	N/A	N/A
26	51	N/A	N/A	N/A

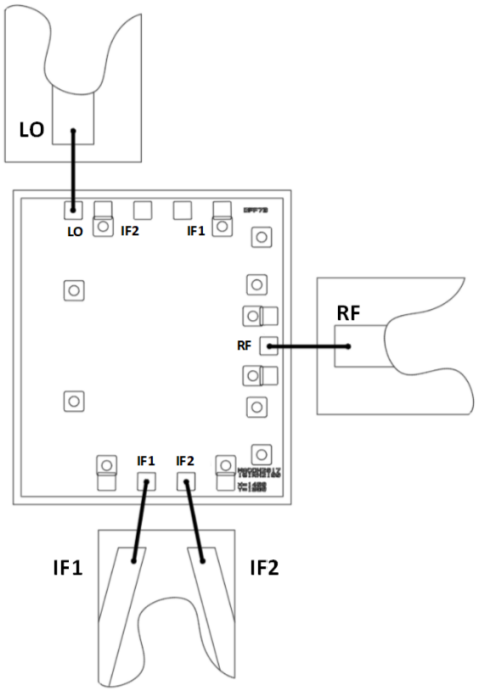
Hybrid Configuration



External Hybrid

- Down conversion and Up conversion data captured with external hybrid 90° coupler part number: Innovative IPP-2345.
- RF Upper Side Band (USB) mode connect hybrid 0° port to IF1 mixer port, 90° hybrid port to IF2 mixer port.
- RF Lower Side Band (LSB) mode connect hybrid 0° port to IF2 mixer port, 90° hybrid port to IF1 mixer port.

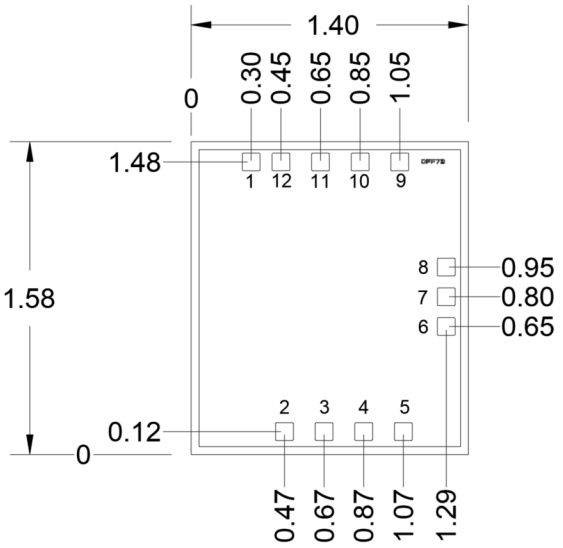
Assembly Guideline



Attach bare die to PCB or carrier using conductive epoxy. Bond die signal pads to PCB 50 Ω traces using 1 mil gold wire. Single bond wire is recommended on each signal pad for optimal performance. There is no need to bond the die ground pads.

Caution: Exposed airbridges are incorporated in the circuit layout on the top surface of this die. These airbridges are sensitive in structure and due care should be taken when handling the die.

Outline Drawing



Bondpad Table (all pads are 90 x 90 µm)[10,11]

Pad #	Pad Name
1	LO
2,5,6,8,9,12	GND
3,10	IF1
4,11	IF2
7	RF

10. Units are in microns with a tolerance of ±5 µm, except for die exterior dimensions which are street-center-to-street-center – nominal kerf, ±20 µm tolerance.
11. Die thickness is 100 ±10 µm.